

PATENT

Atty Docket No.: 200208134-1

App. Scr. No.: 10/632,412

IN THE CLAIMS:

Please find below a listing of all of the pending claims. The statuses of the claims are set forth in parentheses.

1. (Currently Amended) A system comprising:

a hardware platform having a processor and at least one hardware resource, wherein the hardware platform is a hand-held, battery-operated device;

a real time operating system supporting a plurality of software applications running on the hardware platform;

a power manager layer having an application profiles database which stores an application profile for each of the plurality of software applications running on the hardware platform, wherein each application profile describes a first relationship between a processor utilization and a processor clock frequency for the software application and a second relationship between an application data rate and a processor speed for the software application, said power manager layer being arranged to

receive real time input from at least one of the plurality of software applications, wherein the real time input includes the at least one of the plurality of software applications informing the power manager layer, through an application programming interface (API) call embedded in the at least one of the plurality of software applications, of a determination made by the at least one of the plurality of software applications of a change in a current processor or hardware resource requirement of the at least one of the plurality of software applications,

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determine a power management adjustment using the received real time input and the first and second relationships stored in the application profile of the at least one of the plurality of software applications; and

exchange information with at least one of said processor and said at least one hardware resource, wherein said information includes the determined power management adjustment, to implement real time power management responsive to the real time input, wherein the real time power management includes changing the power state of at least one of said processor and said at least one hardware resource in response to the change in the current processor or hardware resource requirement of the at least one of the plurality of software applications.

2. (Canceled)

3. (Currently Amended) An-operating The system as defined in Claim 1 wherein said API call includes at least one of:

a) a notification that the at least one of the plurality of software applications has been initiated; and

b) a notification that the at least one of the plurality of software applications has ended.

4. (Canceled).

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5. (Currently Amended) ~~An-operating~~ The system as defined in Claim 3 wherein said API call includes the resource requirements for the at least one of the plurality of software applications, the resource requirements including at least one of:

- a) a notification that said at least one of the plurality of software applications requires at least one hardware resource; and
- b) a notification that said at least one of the plurality of software applications no longer requires said at least one hardware resource.

6. (Currently Amended) ~~An-operating~~ The system as defined in Claim 1 further comprising:

- a) a hardware abstraction layer, wherein
- b) information is exchanged between said power manager layer and said hardware abstraction layer by means of application-interface calls; and
- c) said hardware abstraction layer is arranged to cause said processor to be actuated in accordance with said calls.

7. (Currently Amended) ~~An-operating~~ The system as defined in Claim 1 further comprising:

- a) a driver layer, wherein
- b) information is exchanged between said power manager layer and said driver layer by means of application-program interface calls.

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8. (Currently Amended) ~~An-operating~~ The system as defined in Claim 1 wherein said power manager layer further comprises:

- a) a processor power state selection mode; and
- b) a hardware resource power state selection mode.

9. (Currently Amended) ~~An-operating~~ The system as defined in Claim 8 wherein said power manager layer includes a resource allocation table.

10. (Currently Amended) ~~An-operating~~ The system as defined in Claim 1 further comprising a driver layer arranged to:

- a) receive an application-program interface call including the processor or hardware resource requirement for the at least one of the plurality of software applications, the processor or hardware resource requirement containing a power state instruction concerning a resource from said power manager layer and to generate a corresponding instruction; and
- b) transmit corresponding information to a hardware abstraction layer by application-program interface call.

11. (Currently Amended) ~~An-operating~~ The system as defined in Claim 6 wherein said hardware abstraction layer is further arranged to:

- a) exchange information with a driver layer by means of program-interface calls;
- and
- b) cause said at least one resource to be actuated in accordance with said calls.

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12. (Currently Amended) A real time power management system for a processor-driven hardware platform for supporting a plurality of software applications, said platform including a hand-held, battery-operated device having at least one hardware resource wherein said processor is characterized by a plurality of power states and said at least one hardware resource is characterized by a plurality of power states, said power management system comprising, in combination:

- a) an operating system for controlling said processor and said at least one hardware resource;
- b) said operating system including a power manager layer having an application profiles database which stores an application profile for each of the plurality of software applications, wherein each application profile describes a first relationship between a processor utilization and a processor clock frequency for the software application and a second relationship between an application data rate and a processor speed for the software application, said power manager layer arranged to

receive real time input from at least one of said plurality of software applications, wherein the real time input includes the at least one of the plurality of software applications informing the power manager layer, through an application programming interface (API) call embedded in the at least one of the plurality of software applications, of a change in a current processor or hardware resource requirement of the at least one of said plurality of software applications,

change at least one of a processor power state and a power state of said at least one hardware resource using said received real time input from the at least one software application and the first and second relationships stored in the application profile of the at

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least one software application, in response to the change in the current processor or hardware resource requirement of the at least one of the plurality of software applications.

13. (Canceled)

14. (Currently Amended) An-integrated The real time power management system as defined in Claim 12 wherein said API call of said at least one of the plurality of software applications additionally includes t at least one of:

- a) a notification that said at least one of the plurality of software applications has been initiated; and
- b) a notification that said at least one of the plurality of software applications has ended.

15. (Currently Amended) An-integrated The real time power management system as defined in Claim 12 wherein said API call of said at least one of the plurality of software applications additionally includes t at least one of

- a) a notification that said at least one of the plurality of software applications requires at least one hardware resource; and
- b) a notification that said at least one of the plurality of software applications no longer requires said at least one hardware resource.

16. (Currently Amended) A method for controlling power consumption in a hardware platform responsive to information from a plurality of software applications,

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wherein the hardware platform is a hand-held, battery-operated device, said platform including a processor having a plurality of power states and at least one hardware resource characterized by a plurality of power states, said method comprising the steps of:

organizing said operating system into a kernel, a driver layer, a hardware abstraction layer, and a power manager layer;

applying real time input from at least one of the plurality of software applications to said power manager layer, wherein real time input includes the at least one of the plurality of software applications informing the power manager layer, through an application programming interface (API) call embedded in the at least one of the plurality of software applications, of a change in a current processor or hardware resource requirement of the at least one of the plurality of software applications,

accessing an application profile for the at least one of the plurality of software applications stored within an application profiles database which stores an application profile for each of the plurality of software applications running on the hardware platform, wherein each application profile describes a first relationship between a processor utilization and a processor clock frequency for the software application and a second relationship between an application data rate and a processor speed for the software application;

determining a power management policy in said power manager layer using said real time input and the first and second relationships stored in the application profile for the at least one of the plurality of software applications;

communicating said power management policy from said power manager layer to said processor or said at least one hardware resource; and

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changing the power state of at least one of said processor and said at least one hardware resource in response to the change in the current processor or hardware resource requirement of the at least one of the plurality of software applications.

17. (Currently Amended) [[A]] The method as defined in Claim 16 wherein the step of determining a power management policy additionally comprises the step of determining a processor power state.

18. (Currently Amended) [[A]] The method as defined in Claim 16 wherein the step of determining a power management policy additionally comprises the step of determining a power state of said at least one hardware resource.

19. (Canceled)

20. (Currently Amended) [[A]] The method as defined in Claim 16 wherein the step of communicating said power management policy from said power manager layer to said processor and said at least one hardware resource additionally includes the steps of:

embedding application-program interfaces into said power manager layer, said driver layer and said hardware abstraction layer; and

communicating said power management policy by means of said calls.